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Nuclear

10 CFR 50.73

May 27, 2005
BW050049

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Unit 2
Facility Operating License No. NPF-77
NRC Docket No. STN 50-457

Subject: Submittal of Licensee Event Report Number 2005-002-00, "Braidwood Unit 2 Reactor Trip Due to Main Generator 'C' Phase Bushing Failure Due to Overheating"

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73, "Licensee event report system", paragraph (a)(2)(iv)(A). 10 CFR 50.73(a) requires an LER to be submitted within 60 days after discovery of the event; therefore, this report is being submitted by May 27, 2005.

Should you have any questions concerning this submittal, please contact Mr. Dale Ambler, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,



Keith J. Polson
Site Vice President
Braidwood Station

Enclosure: LER Number 2005-002-00

cc: Regional Administrator - Region III
NRC Braidwood Senior Resident Inspector

JE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Braidwood, Unit 2

2. DOCKET NUMBER

05000457

3. PAGE

1 of 3

4. TITLE

Braidwood Unit 2 Reactor Trip Due to Main Generator 'C' Phase Bushing Failure Due to Overheating

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED																																					
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER																																				
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9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)																																											
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10. POWER LEVEL																																														
100																																														

12. LICENSEE CONTACT FOR THIS LER

NAME

Michael Smith, Engineering Director

TELEPHONE NUMBER (Include Area Code)

(815) 417-3800

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	TB	GEN	W120	Y	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On March 28, 2005, at 1246, the Unit 2 main generator tripped as a result of a fault on the main generator "C" phase (T-3) bushing, followed by a turbine trip and reactor trip. Operator response to the trip was proper and all safety equipment operated as expected, with minor exceptions.

The root cause of the Unit 2 trip was determined to be the lack of technical rigor applied during the redesign of the bushing in the 2000 time period. Contributing to this event was the unavailability of spare parts and lack of Original Equipment Manufacturer expertise due to the sale of the bushing product line. Corrective actions include implementation of a Technical Human Performance Program, evaluating the addition of thermography windows to allow online monitoring of the bushings, and formalizing of the corporate high voltage bushing strategy.

There were no safety consequences impacting plant or public safety as a result of this event.

This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv)(A).

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Braidwood, Unit 2	05000457	YEAR	SEQUENTIAL NUMBER	REVISIO N NUMBE	2 OF 3
		2005	- 002 -	00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

A. Plant Operating Conditions Before The Event:

Event Date: March 28, 2005 Event Time: 1246

Unit: 2 MODE: 1 Reactor Power: 100 percent

Unit 2 Reactor Coolant System (RCS) [AB] Temperature: 581 degrees F, Pressure: 2236 psig

B. Description of Event:

There were no additional structures, systems or components inoperable at the beginning of the event that contributed to the severity of the event.

On March 28, 2005, at 1246, the Unit 2 main generator [TB] tripped as a result of a fault on the main generator "C" phase (T-3) bushing, followed by a turbine trip and reactor trip. An Engineered Safety Feature [JE] actuation of the auxiliary feedwater (AF) [BA] system occurred on low steam generator level. Operator response to the trip was proper and all safety equipment operated as expected, with the following minor exceptions:

- The tube side relief for the 27B heater lifted.
- Based on main control room indications, the 2AF005H, an air operated flow control valve for the 2D steam generator, failed full open when the AF system started following the reactor trip. Operator response was to control the steam generator level with the 2AF013H, the motor operated valve.
- 2CV121, the level control valve for the volume control tank [CB], was operating erratically in automatic after the Unit 2 reactor trip. Operator response was to place the valve in manual and stabilize flow and level. After a couple of hours, the 2CV121 controller was returned to Auto and the system was stable.

C. Cause of Event

The root cause of the Unit 2 trip was determined to be the lack of technical rigor applied during the redesign of the bushing in the 2000 time period. Contributing to this event was the unavailability of spare parts and lack of Original Equipment Manufacturer (OEM) expertise due to the sale of the bushing product line.

The bushing failed as a result of alterations made during refurbishment at a non-OEM repair facility.

The bushing was originally installed in the Byron Unit 2 main generator (T-3 position) and removed in 1999 due to signs of overheating. The bushing was sent to two non-OEM vendors for refurbishment. The first vendor could not disassemble the bushing. The bushing was then sent to a second vendor, where a problem in disassembly required changes to the design, including adding a second threaded connection and a solder joint to the bushing lower flange. The failure occurred at the second threaded connection.

After refurbishment, the bushing was accepted and returned. During the Braidwood fall 2003 refueling outage, the refurbished bushing was installed in the Braidwood Unit 2 main generator in the T-3 position as a replacement for an original bushing that had showed signs of overheating.

Inspections subsequent to the Unit 2 trip showed that the main generator T-3 bushing had suffered a catastrophic failure at a threaded connection between the bushing conductor and the bushing bottom flange. The bottom flange connection had been altered at the repair facility during bushing refurbishment. This failure caused the bottom flange and the bus adaptor to drop approximately six inches resulting in a ground fault and generator trip.

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During the bushing refurbishment process, some level of awareness existed by company personnel that a unique repair was being performed on this bushing. The company personnel defaulted to the repair vendor to provide the technical expertise due to not having sufficient experience in this area to render a technical judgment on the redesign. Because this component was non-safety related commercial grade, it was not subject to 10CFR50, Appendix B requirements for independent design review. This, coupled with the fact that no specific Exelon technical human performance process existed at that time, resulted in the bushing not being reviewed in more detail for design adequacy.

D. Safety Consequences:

There were no safety consequences impacting plant or public safety as a result of this event. The reactor trip occurred automatically due to the protective system actuation at the required setpoint by a ground over-current relay. Risk level remained low throughout this event. Following the reactor trip all safety equipment operated as required except for minor functions as noted in Section B of this report.

This event did not result in a safety system functional failure.

E. Corrective Actions:

Corrective Actions include:

- Implementation of a Technical Human Performance Program (Complete)
- Evaluating the addition of thermography windows to allow online monitoring of the bushings
- Formalization of the corporate high voltage bushing strategy

F. Previous Occurrences:

There have been no similar Licensee Event Report events at Braidwood Station in the last three years.

The extent of condition is limited to the failed bushing for Byron and Braidwood. The unique repair implemented in the bushing in the 2000 time period was a one-time event. There are no other bushings at Byron and Braidwood that have been modified from original design.

G. Component Failure Data:

<u>Manufacturer</u>	<u>Nomenclature</u>	<u>Model</u>	<u>Mfg. Part Number</u>
Westinghouse	Main Generator Terminal Bushing	NA	7344D09G01